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Observations on the Feeding, Shedding and Growth Rates of Captive Snakes (Boidae)

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Introduction

OPPORTUNITIES for recording the growth rates and observing certain activities of the large boids are exceedingly limited. Field studies are non-existent because of the difficulties of restraining and measuring in the wild creatures of such great size and strength, and among captive specimens, those responsible for them are usually reluctant to subject them to the necessary handling for even so worthy an objective as the collecting of new data. Few observations of even the feeding schedules and shedding rates of these great serpents have been recorded. Thus our knowledge of many aspects of their life histories is very meager.

The Highland Park Zoological Gardens in Pittsburgh has had in its care several well-adjusted pythons and boas, snakes with which certain liberties may be taken. The senior author initiated a series of observations during his tenure as Zoo Herpetologist from 1946 to 1952, observations which his successor, the junior author, resumed and expanded, beginning in 1953 and continuing through the present. A summary of their findings is presented in this paper.

Reptilian Growth Rates

The misconception that reptiles generally grow slowly has long been widely accepted. It is surprising that this fallacy has been so tenacious when one considers the volume of data refuting it, data that are based on several reptilian orders.

Heller (1902) reported that a juvenile Galapagos tortoise (*Testudo vicina*) increased in weight from 29 pounds to 130 pounds in three years. Ditmars (1933) observed the growth rate of captive alligators (*Alligator mississippiensis*) and found that newly hatched young having a length of eight inches and a weight of only 1.75 ounces could in six years attain a length of 72 inches and a weight of 72 pounds. Breeding adults continued this rapid growth for a time, so that a six-foot eleven-inch specimen grew 55 inches in six years to a length of eleven feet six inches. McIlhenny (1935) validated Ditmars' figures with a field study that yielded essentially identical information.

Pope (1957) has reported that an Indian Rock Python (*Python molurus*) in his custody was "about 24 inches" long on hatching. At the age of one year its length had reached 60 inches and its weight 3.5 pounds; at two years, 100 inches and 21 pounds; at three years, 125 inches and 38 pounds. Oliver (1952), reporting the first year's growth of three *molurus* hatched in the New York Zoological Park, stated, "One year ago on this date . . . our three young Indian Rock Pythons emerged from their eggs. They were then only a little more than one foot in length and weighed under four ounces . . . On their first anniversary the largest measured four feet two inches in over-all length and weighed a pound and a half . . . The other two individuals are only slightly smaller than their brother." Wall (1921) mentions one brood of this species in which the hatchlings were "about 2 feet." In a second brood, the young upon hatching averaged two feet five inches. Some of these grew eleven inches in only four months. It is clear from all these observations that young reptiles may indeed grow rapidly.

There is, however, less information available regarding the growth rate of pythons and boas once they have reached maturity. Loveridge (1945) recorded a *Python reticulatus* at the London Zoo that grew from a length of ten feet to twenty-one feet in ten years. "Another took fourteen years in which to grow from 19 to 24 feet. On this basis we can roughly estimate

growth as proceeding at the rate of a foot per year in the period between 10 and 20 feet, but at only about half that rate subsequently." Hence, even among the initiated, the notion persists that these giant snakes grow rapidly at first, but can increase their dimensions only very slowly after they have achieved adult proportions. The following data lead us to reconsider this hypothesis.

Python sebae

Our own observations agree with earlier conclusions that young boas and pythons grow rapidly. When an African Rock Python was received on October 3, 1951, its length of slightly over two feet indicated an age of less than one year. Thirteen months later it measured between three and three and one-half feet and had a greatest diameter of three-fourths of an inch. Since the snake shed its skin seven times during this first year, there was a length increment of some two inches per shedding. No periodic measurements were taken subsequently, but on May 9, 1957, the python was found to be nine feet three inches in length and 37 pounds in weight. With only a few months of the first year unknown, the average annual increase in length for this snake's first six years was 14 inches. On June 18, 1960, its length was 11 feet 2 inches and its weight 56 pounds. Thus during 37 months of its seventh, eighth and ninth years, it had an average annual increment of only 7.6 inches and 6.3 pounds. Its food intake during this period totaled 148 pounds, or 7.8 pounds of food for every pound of weight gained. The animal has been kept in a temperature between 73° and 78° Fahrenheit and supplied with excess food all 12 months of the year. A record of the food it consumed is presented in Table I.

Python molurus

The Indian Rock Python, a light-colored female, was within a few inches of nine feet when received on December 18, 1947. Because the snake had a tendency toward rectal prolapse, as well as for other reasons, it was measured but twice during its ten years' tenancy in the Pittsburgh Zoo's reptile wing. On January 21, 1955, it measured just 13 feet in total length. On January 7, 1958, it was found dead and at this time measured 13 feet 8 inches in over-all length. Its weight a few weeks earlier had been found to be 39 pounds. The slow growth during its last three years and the decidedly low ratio of weight to length are clearly not normal, and thus limit the value of these data. Pope's observations (1957) on the same species, already noted, should be compared. The present specimen increased its length by only 56 inches in ten years, despite a total food intake of 654 pounds. Forty-eight inches of this total was gained during its first seven years, or an average of seven inches per annum. Records of this specimen's food intake and shedding frequency are presented in Table II.

Python reticulatus

Perhaps the most spectacular snake now on display in the United States is "Colossus," the male Reticulated Python received at the Pittsburgh Zoo on August 10, 1949. The locality from which it was taken is unknown, but the fact that it was shipped to the United States from Singapore suggests that it was probably of Malayan origin. On arrival, its length was just 22 feet. After having rejected the fowl and rabbits offered it during its first two months, it ac-

TABLE I. FOOD INGESTED BY A CAPTIVE *Python sebae*, 1951-1960

Year	Feedings	Food Taken				Total Weight of Food (lbs.)
		Mice	Rats	Rabbits	Other	
1952*	17	32	8 juv.	—	—	2.5
1953	33	110	11 juv.	—	2 English sparrows	11.0
1954	20	91	4 juv.	—	2 pigeons	8.3
1955	26	46	1	19	2 starlings, 1 guinea pig	47.7
1956	10	—	2	8	2 guinea pigs	27.5
1957	12	—	—	11	3 ducks	48
1958	13	—	—	12	3 squirrels	52
1959	8	—	—	11	—	48
1960	9	—	—	6	2 chickens, 1 duck	44
8¾ yrs.	148					289

*First eight months.

TABLE II. FOOD CONSUMPTION AND SHEDDING FREQUENCY IN A CAPTIVE *Python molurus*, 1948-1957

Year	Feedings	Food Taken			Total Weight of Food (lbs.)	Dates of Shedding
		Rats	Rabbits	Other		
1948	14	45	—	1 pigeon, 1 jungle fowl, 3 ducks	59	Apr. 16, Aug. 5
1949	13	69	—	———	67	May 4, Aug. 3
1950	8	26	4	———	36	Mar. 7, May 19, Sep. 23
1951	12	—	18	1 duck	80	Mar. 4, Aug. 7, Oct. 26
1952*	6	1	11	———	59	Apr. 5, June 10, Aug. 7
1953	12	—	7	6 ducks, 2 guinea pigs	68	Mar. 29, Oct. 5
1954	6	—	1	8 ducks	52	Mar. 12, Sep. 27
1955	4	—	5	———	34	No record
1956	11	—	12	3 ducks	85	"
1957	13	—	15	7 ducks, 3 pigeons	114	"
9¾ yrs.	99				654	

*First eight months.

cepted the first pig offered. This was on October 14 when it took a 15-pound suckling. Thus began a pattern of regular feeding that has continued until the present time (Table III).

This Reticulated Python has accepted nothing but pigs; rabbits, chickens and ducks have been refused on several occasions. When hungry, the snake strikes and seizes the prey with its mouth immediately upon the animal's introduction into the cage. It is instantly enmeshed in one or one and a half coils. This grasp is usually retained for about 15 to 25 minutes although the prey rarely survives longer than three minutes. Stunned food-animals receive the same treatment as active ones. After the long waiting period, the mouth grip is freed and the coils are relaxed without being released, as the snake begins a thorough investigation of its food, the tongue flicking leisurely in and out throughout the process. If the snout and ears of the prey chance to be buried in the gravel of the cage floor, the snake prolongs its search and finally grasps the

TABLE III. FOOD CONSUMPTION AND SHEDDING FREQUENCY IN A CAPTIVE *Python reticulatus*, 1949-1960

Year	Feedings	Pigs	Total Weight of Food (lbs.)	Dates of Shedding
1949*	4	4	98	Dec. 2
1950	9	9	287	Feb. 11, Apr. 29, July 1, Sep. 12, Nov. 10
1951	6	6	203	Feb. 11, Apr. 18, July 10, Oct. 6, Dec. 20
1952†	7	7	202	Mar. 30, July 6
1953	6	6	169	Feb. 10, Aug. 25
1954	5	5	161	Feb. 13, Dec. 22
1955	5	5	154	Apr. 16, Oct. 23
1956	4	4	108	Mar. 8, July 3, Sep. 30, Dec. 20
1957	5	5	136	Mar. 10, May 13, Aug. 5, Oct. 8
1958	5	5	128	Apr. 1, June 8, Nov. 4
1959	6	6	184	July 8, Aug. 31, Nov. 19
1960	6	6	161	Feb. 11, Aug. 2, Nov. 1
11 years	68		1991	

*Last five months.
†First nine months.

animal again, nearly always by the shoulder, and drags it a foot or two before resuming its investigation. Should this procedure fail to disclose either the snout or an ear, the snake may lose interest and abandon the attempt to feed, or it may repeat its effort to locate one of these crucial points by again moving the prey. Apparently this snake will secure its mouth grip preparatory to swallowing at only one of two points: the snout or an ear. Indeed, the identification of one of these two points by the snake's tongue may possibly be thought of as a releaser mechanism which triggers the engulfing behavior.

The largest pig offered to this python weighed 54 pounds. It in no way taxed the snake's capacity and was swallowed in 64 minutes.

This Reticulated Python was 22 feet long when received on August 10, 1949. On June 4, 1951, it was approximately 23 feet 3 inches long, having increased about 15 inches in 22 months. Perhaps our most accurate size data for this specimen were obtained on February 24, 1954, when it was found to weigh 295 pounds. The junior author noted the weight in his daily journal on that date and stated: "This was shortly after its winter fast of 4½ months. The snake was then returned to its transfer cage. I opened the transfer door, which is 14 × 18 inches, and the python began to crawl back into its main cage. By placing a measuring tape on its back and working along hand over hand so that it would not slip, I got a measurement of 27 feet, two inches, which I believe will be as accurate a measurement as we shall get until the snake dies." The specimen had grown 47 inches in 32½ months. On November 15, 1956, it was found to measure 28 feet 6 inches, having grown 16 inches in the intervening 33 months. The snake has shed from two to five times a year.

We cannot offer these length data as exact measurements, because of the way in which they had to be collected, but we are certain that they are accurate within a few inches. They show that large snakes can continue to grow at an appreciable rate after they have achieved adult dimensions. Having attained 85 percent. of the maximum length known for its species, this specimen is still growing at an average rate of 10.75 inches per year. This figure is in good agreement with a recent report from the New York Zoological Park of a 19-foot 4-inch, 170-pound Reticulated Python that gained 10 inches and 26 pounds in a single year.

A. C. Stimson's observations (*in litt.*) on a male Reticulated Python in the Houston Museum of Natural History show how great may be the range of variation in growth rates under different conditions: "We have had it for 22 years and it was approximately 18 feet long when received. It now measures 24 feet, five inches and weighs 247 pounds." Hagenbeck's prize Regal Python was 28 feet in length, and weighed 250 pounds (Pope, 1937). This was the heaviest snake for which we find a definite record, so that the Pittsburgh specimen may be the heaviest snake ever weighed under reliable conditions. It would be unreasonable to suppose, however, that this captive would outweigh the record 32-foot specimen, for which no weight was recorded. We may assume that a snake of the latter dimensions greatly exceeds 300 pounds in weight.

Eunectes murinus

Our larger Anaconda measured 16 feet 4 inches and weighed 108 pounds when it was received from a shipper in Belem, Brazil, on June 13, 1950. After shedding on June 24, it refused living pigs, rabbits, ducks and carp through an eight-week period until, on August 10, it accepted a small mallard duck. Since that date only waterfowl—mallard ducks, white pekin ducks and a snow goose—have been accepted (Table IV).

The Anaconda has grown more slowly than the pythons. On February 26, 1954, it was found to be 18 feet 7 inches long and to weigh 160 pounds. This represented a gain of 27 inches and of 52 pounds in 44 months. By March 21, 1957, it had attained a length of 19 feet 6 inches and a weight of 200 pounds, having increased its length by 11 inches and its weight by 40 pounds in 36 months. Most recently, measurements were recorded July 10, 1960, when the snake's total length was found to be 20 feet 7 inches. This represents an increment of 13 inches in 40 months. It was not weighed.

The average annual length increment for this specimen during nearly eleven years in captivity was only five inches. It may be that this growth rate would have been increased if more food had been accepted, but the snake refused to increase its intake despite every opportunity to do so. During the 81 months between the earliest and most recent weighings, a net gain of 92 pounds has been recorded. During this same period it consumed 539 pounds of waterfowl, or 5.86 pounds for every pound of weight gained. Despite our Anaconda's very lethargic behavior, it cannot compare in efficiency with Pope's (1957) phenomenal young *Python molurus* which reportedly gained a pound for every 1.76 pounds of food consumed. Pope (1955) mentions a gravid female Anaconda having a length of 19 feet which weighed 236 pounds. Soon thereafter she gave birth to 72 young, each of

TABLE IV. FOOD CONSUMPTION AND SHEDDING FREQUENCY IN A CAPTIVE *Eunectes murinus*, 1950-1960

Year	Feedings	Ducks	Total Weight of Food (lbs.)	Dates of Shedding
1950	8	20	54	June 24
1951	14	24	114	Feb. 7, May 30, Sep. 13
1952*	8	17	88	Jan. 25, June 13
1953	8	17	83	Mar. 3, Sep. 17
1954	7	13	65	Jan. 8, July 1
1955	7	16	80	Jan. 8, July 18
1956	6	11	55	May 8, July 14, Dec. 16
1957	7	12	72	May 16, Nov. 29
1958	9	12	68	May 2
1959	8	11	65	No record
1960	7	8	52	May 1, Aug. 11
10½ years	89		796	

*First eight months.

which was about 38 inches. Assuming that each of these young weighed about a pound, the mother's residual weight would have approximated that recorded for our specimen of comparable length.

The average growth per ecdysis for the *murinus* is again seen to be a little more than two inches. This figure is notably constant in the four snakes reported herein.

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